

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile	)	GN Docket No. 14-177
Radio Services	)	
	)	
Establishing a More Flexible Framework to	)	IB Docket No. 15-256
Facilitate Satellite Operations in the 27.5-28.35	)	
GHz and 37.5-40 GHz Bands	)	
	)	
Petition for Rulemaking of the Fixed Wireless	)	RM-11664
Communications Coalition to Create Service Rules	)	
for the 42-43.5 GHz Band	)	
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95,	)	WT Docket No. 10-112
and 101 To Establish Uniform License Renewal,	)	
Discontinuance of Operation, and Geographic	)	
Partitioning and Spectrum Disaggregation Rules	)	
and Policies for Certain Wireless Radio Services	)	
	)	
Allocation and Designation of Spectrum for Fixed-	)	IB Docket No. 97-95
Satellite Services in the 37.5-38.5 GHz, 40.5-41.5	)	
GHz and 48.2-50.2 GHz Frequency Bands;	)	
Allocation of Spectrum to Upgrade Fixed and	)	
Mobile Allocations in the 40.5-42.5 GHz	)	
Frequency Band; Allocation of Spectrum in the	)	
46.9-47.0 GHz Frequency Band for Wireless	)	
Services; and Allocation of Spectrum in the 37.0-	)	
38.0 GHz and 40.0-40.5 GHz for Government	)	
Operations	)	

**COMMENTS OF AVANTI COMMUNICATIONS GROUP PLC.**

Avanti Communications Group plc ("Avanti") is a UK headquartered Ka-band satellite operator based in London. Avanti has already committed over US \$1.2 billion in the deployment of existing and already procured Ka-band satellite systems. Avanti hereby submits these comments in response to the Federal Communications Commission's ("FCC" or

“Commission”) Notice of Proposed Rulemaking (“NPRM”) in the above referenced proceeding.<sup>1</sup>

## **I. INTRODUCTION**

The World Radiocommunication Conference (“WRC-15”) concluded that, in respect of WRC-2019 activities, the International Telecommunication Union (“ITU”) should conduct studies on frequency-related matters for International Mobile Telecommunications (“IMT”) identification, including possible additional allocations to the mobile services on a primary basis. A key outcome of the WRC-15, as recorded in Resolution 238 COM6/20 was the exclusion of the 27.5 – 30.0 GHz frequency band from the scope of this Resolution.

The exclusion of any part of the range 27.5 – 30.0 GHz from the scope of the Resolution 238 was taken in clear recognition of the importance placed by most administrations around the world on the use of Ka-band for satellite services and the incompatibility between ubiquitously deployed earth stations and terrestrial mobile broadband applications in the same frequency bands.

It is apparent that the band 27.5 - 28.35 GHz (“28 GHz”) has little prospect as an internationally harmonised band for 5G / IMT-2020 mobile broadband. However, other bands were included in the scope of Resolution 238, including the band 37 - 38.6 GHz (“37 GHz”) and the band 38.6 - 40 GHz (“39 GHz”) which are also proposed by the Commission for mobile broadband.

Avanti’s previous input to the Commission Notice of Inquiry (“NOI”) on the use of additional spectrum bands above 24 GHz for 5G IMT radio services proposed that the

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<sup>1</sup> Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, Notice of Proposed Rulemaking, FCC 15-138, 30 FCC Rcd. 11878 (2015) (“NPRM”)

identification of new bands for mobile broadband services should not be at the expense of other radio services that are an integral part of the global broadband infrastructure and telecommunications ecosystem. Satellite Ka-band<sup>2</sup> broadband systems are a part of that infrastructure and deployment in the United States over the past few years has seen substantial investment, with the launch of a new generation of satellites that is now offering increasingly robust broadband services to Americans<sup>3</sup>. For example, today satellite services provided by Hughes go as high as 15/2 Mbps and by ViaSat as high as 12/3 Mbps<sup>4</sup>.

Furthermore, many satellite operators around the world operate or plan to operate global or regional satellite services using Ka-band frequencies. These satellite networks do and will provide valuable services in many regions around the world including enabling terrestrial services. For example, Arabsat, Avanti, Chinasat, EchoStar, Eshailsat, Eutelsat, Gascom, Hispasat, Inmarsat, Intelsat, Nilesat, Nigcomsat, O3b, RSCC, SES, Telenor, Telesat, Thaicom, Turksat, Viasat, Yahsat, and the governments of Brazil, Australia and France currently operate or plan to operate satellite systems within the 24.65-25.25 / 17.3-17.8 / 21.4-22 GHz and 27.0-30.0 / 17.7-20.2 GHz Ka-band frequencies.

As the C and Ku-band are becoming more and more congested, most new broadband and telecommunication satellite operators will deploy Ka-band technology in the coming years which is why a sustainable future growth in Ka-band needs to be protected. Ka-band investment is radically increasing in the coming few years and this is without considering the

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<sup>2</sup> 27.0-30.0 / 17.7-20.2 GHz

<sup>3</sup> 2014 Fourth Measuring Broadband America Report at 4-5; see also id. at 15-16, 18

<sup>4</sup> See ViaSat, High-Capacity Satellite System, <http://www.viasat.com/broadband-satellite-networks/high-capacity-satellite-system> (last visited Jan. 20, 2015). According to Hughes, it currently provides satellite Internet service to approximately 935,000 U.S. subscribers utilizing its Jupiter 1 (EchoStar 17) and SPACEWAY 3 satellites with speeds up to 15 Mbps/2 Mbps.

huge investment in ground infrastructure and customer equipment, each of which are projected to increase radically in the near future.

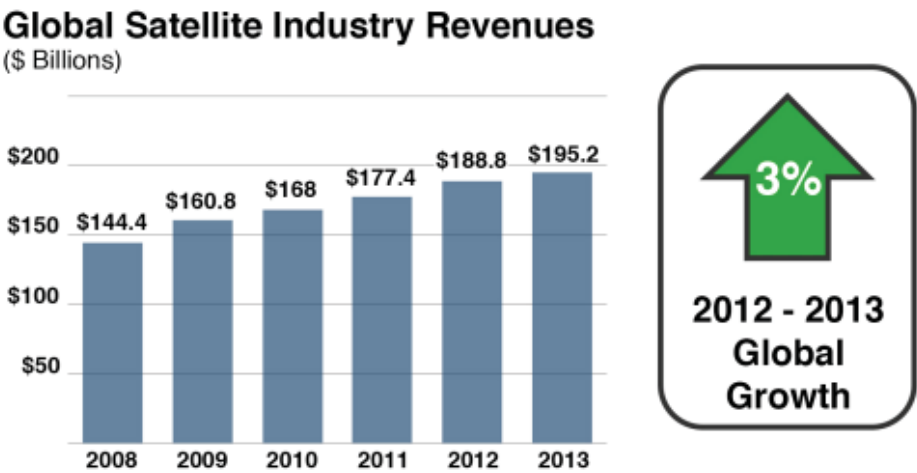


Figure 1: Global satellite industry revenue

The United States has world recognised skills in the manufacture of Ka-band satellites. Similarly, in the launcher category there is a value chain involving component, subsystem providers as well as integrators and launch service providers.

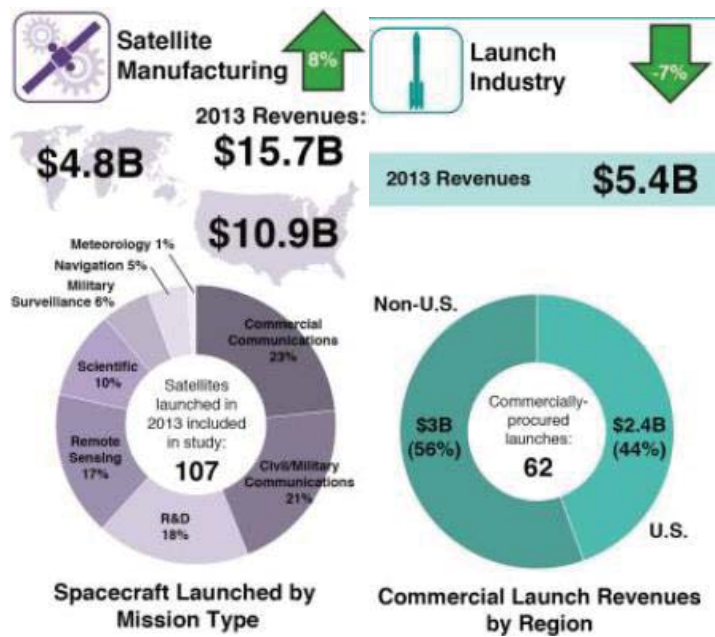


Figure 2: US satellite industry from manufacturing to launching of satellites

## **II. INTERNATIONAL HARMONIZATION FOR ALL POTENTIAL SERVICES**

Today, the U.S. satellite industry is a world leader in Ka-band. In addition to revenue growth, more than 225,000 people were employed in sustainable highly skilled, high-value add jobs by the private sector satellite industry in the U.S. through the third quarter of 2013 and that number continues to grow.

Avanti recognizes the importance of the future requirements for globally harmonized spectrum for IMT services in relevant frequency bands above 24 GHz. However we note that the Commissions NPRM proposes to continue to consider authorizing terrestrial mobile operations in the 28 GHz band, which we believe would not only jeopardize the U.S. satellite industry's growth and investment in this band but is also misaligned with the parallel discussions within the ITU in the context of WRC-19 agenda item 1.13. Given that the 28 GHz band does not have broad international support for future IMT-2020 / 5G use and will therefore not achieve consensus during the development stage of IMT, continuing to consider it would risk further delaying the rollout of 5G services in the United States.

In addition, the consideration of the 28 GHz band would not be consistent with the NPRM's own criteria to achieving a substantial international harmonization in order to help promote development of millimeter wave ("mmW") mobile service by reducing development and equipment costs and promoting a unified world market. Indeed, all regulators around the world have frequently highlighted international harmonization of spectrum as a key policy goal and have endorsed the benefits of global harmonization.

### III. SATELLITE KA-BAND DEPLOYMENT AND INTERFERENCE FROM VSATS AND GROUND EARTH STATIONS (GESS) TO IMT/ 5G

One key technical issue that we raised during the Notice of Proposed Rulemaking (NOI) was the aggregate interference from a progressively increasing population of 5G base stations and mobile stations into GEO and non-GEO Ka-band satellite receivers on the Earth-to-space path. Satellite beams cover relatively large geographic areas, in which many hundreds of thousands and millions of 5G stations could be deployed and so the interference received is an aggregation of interference from potentially very large numbers of 5G transmitters. We do not consider it is feasible to establish limits on the EIRP of 5G base stations and mobile stations that would adequately protect satellite uplinks in a manner that could also allow for the operation of 5G systems in both indoor and outdoor environments.



Figure 3: Key Interference issues between FSS and 5G within 28 GHz

Interference from Ka-band VSATs and Ka-band Ground Earth stations (GESs) to IMT/ 5G base stations and mobile stations would also be problematic on the terrestrial path, which would require large separation distances required between earth stations and IMT/ 5G stations. This is incompatible with ubiquitous deployments of Ka-band VSATs across the United States where the vast majority of VSAT deployment is in urban and suburban areas

which would not enable sustainable and viable Ka-band satellite system and Ka-band satellite service deployments in the 27.5 – 29.5 GHz band.

#### **IV. THE 31.8-33.4 GHZ BAND FOR IMT DEVELOPMENT**

Avanti appreciates that the NPRM is focussed on the bands where spectrum for 5G is considered to be potentially available. However, the 28 GHz band is not the only option within the FCC's discretion. We appreciate that the NPRM has opened consideration to the 31.8 - 33.4 GHz band (the "32 GHz band") – which was the most commonly supported band during the WRC-15 for IMT/5G – as a suitable candidate band for IMT services. State of the art technology can enable a large bandwidth block to support one RF component with reasonable complexity. For instance, 1.2 GHz of bandwidth covering the range 31.8 – 32.0 GHz could be covered by one RF component when the center frequency is 32.4 GHz. We note that the 33.0 -33.4 GHz is used for Federal satellite systems under US FN G117<sup>5</sup> and that there could be challenges in developing sharing arrangements.

The 31.8 – 33.0 GHz band represents up to 1.2 GHz of contiguous spectrum for future 5G mobile broadband use. This 1200 MHz of spectrum is 50% greater than the 800 MHz of spectrum in the 27.5 – 28.35 GHz band proposed in the NPRM and should allow for greater scope for development of 5G / mobile broadband services.

It is expected that such the 32 GHz frequency range could be implemented by a single 5G mobile device that could enjoy the prospect of global roaming in around the year 2020.

Avanti suggests that the Commission considers additional bands for mmW mobile use in light of the international decisions from the ITU WRC-15, and interacts with relevant

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<sup>5</sup> G117 In the bands 7.25-7.75 GHz, 7.9-8.4 GHz, 17.375-17.475 GHz, 17.6-21.2 GHz, 30-31 GHz, 33- 36 GHz, 39.5-41 GHz, 43.5-45.5 GHz and 50.4-51.4 GHz, the Federal fixed-satellite and mobile-satellite services are limited to military systems.

stakeholders to examine the suitability of those bands for mobile IMT services. Some 5G proponents have also identified the 31.8 - 33.4 GHz band as a recommended spectrum band – for instance, Samsung, a pioneer in the development of 5G trials in the United States, asked the Commission to consider and prioritize the 31.8 - 33.4 GHz<sup>6</sup>.

We also note the Commission's concern that this band currently has no mobile allocation, whereas there are existing mobile allocations for other bands under consideration. This concern should be alleviated by the fact that the ITU WRC-15 outcome decided to conduct and complete in time for ITU WRC-19 the appropriate sharing and compatibility studies for the frequency bands 31.8 - 33.4 GHz which would therefore allow for an additional allocation in the Radio Regulations to the mobile service on a primary basis at WRC-19. The FCC can in event at a national level implement a primary Mobile Service allocation within the 31.8 – 33.0 GHz band (and possibly up to 33.4 GHz).

We also note the Commission's concern regarding the protection of passive services adjacent to this band (e.g. passive sensors in the band 31.3 - 31.8 GHz). Sharing studies to be conducted by the ITU-R for WRC-19 agenda item 1.13 will consider services in adjacent bands and will develop technical measures, if necessary, to protect passive services from interference from 5G mobile broadband systems. Also, we do not believe that deep-space research utilization of this band for downlinks would hamper nor severely limit the availability of usable spectrum in this band considering that such research facilities are very few in number and are located in very isolated remote areas in the US that could be protected from interference from 5G / mobile broadband systems.

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<sup>6</sup> Use of Spectrum Bands Above 24 GHz For Mobile Radio Services; GN Docket No. 14-177; Written Ex Parte Communication



The Commission's view that satellite technology *"is particularly important for communication in remote areas that are unserved or underserved by terrestrial communication facilities' and can provide vital connectivity for first responders in emergencies and natural disasters"*<sup>7</sup> is a misleading view, since it implies that satellite services are only utilized in unserved remote areas and for emergency access. We would like to draw the Commission's attention to the Commission's own report of 2015 on "Broadband Progress" in the United States which shows the important role satellite services are playing in promoting the broadband delivery in the United States.<sup>8</sup>

Figure 5 shows that the level of penetration via satellite connectivity across the United States by Viasat Exede subscriber distribution maps almost exactly the US population density.

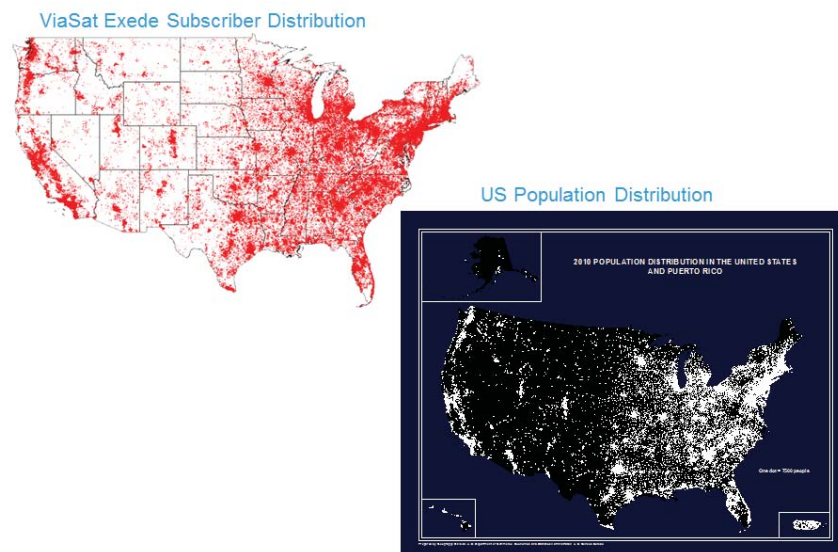


Figure 4: Satellite Subscriber Distribution

This report states that satellite broadband service has improved significantly, and many consumers today have high speeds, low prices, and generous data usage allowances. It is undeniable that today satellite broadband providers offer a range of speeds with different

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<sup>7</sup> NRPM para 33

<sup>8</sup> [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-15-10A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-10A1.pdf)

usage limits at different prices, depending on the type of services, with monthly service price offerings competitive with terrestrial services.

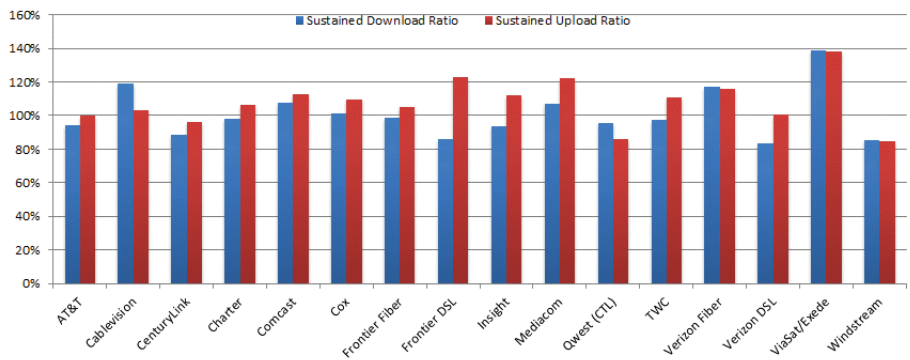


Figure 5: Satellite Can Compete with Terrestrial<sup>9</sup>

In addition, satellite industry operators have reduced overall latency by making improvements to other elements of their architecture.<sup>10</sup>

**V. CONCLUSION**

Avanti, believes that the Commission’s plans for terrestrial 5G systems should not consider the 28 GHz band in order to ensure a long term sustainable outcome for all ICT stakeholders of the 5G terrestrial and satellite industries.

Instead, we urge the Commission to actively promote the inclusion of the 32 GHz band in this NPRM for future IMT / 5G mobile use in the US, given its high prospects of global harmonisation for 5G mobile broadband.

Finally Avanti supports the comments filed by ESOA as this would address the needs of the terrestrial 5G community whilst protecting the investment that has and is being made

<sup>9</sup> FCC Measuring Broadband America Report  
<sup>10</sup> 2014 Fourth Measuring Broadband America Report at 18

in the 28 GHz band by the U.S. satellite industry as well as the continued delivery of broadband services via satellite in this band.

Respectfully submitted

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